

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (original): Method for producing a workpiece, and, for example, a plate, of steel which is resistant to abrasion and whose chemical composition comprises, by weight:

$$0.35\% \leq C \leq 0.8\%$$

$$0\% \leq Si \leq 2\%$$

$$0\% \leq Al \leq 2\%$$

$$0.35\% \leq Si + Al \leq 2\%$$

$$0\% \leq Mn \leq 2.5\%$$

$$0\% \leq Ni \leq 5\%$$

$$0\% \leq Cr \leq 5\%$$

$$0\% \leq Mo \leq 0.50\%$$

$$0\% \leq W \leq 1.00\%$$

$$0.1\% \leq Mo + W/2 \leq 0.50\%$$

$$0\% \leq B \leq 0.02\%$$

$$0\% \leq Ti \leq 2\%$$

$$0\% \leq Zr \leq 4\%$$

$$0.05\% \leq Ti + Zr/2 \leq 2\%$$

$$0\% \leq S \leq 0.15\%$$

$$N < 0.03\%$$

- optionally from 0% to 1.5% of copper,
- optionally at least one element selected from Nb, Ta and V at contents such that $Nb/2 + Ta/4 + V \leq 0.5\%$,
- optionally at least one element selected from Se, Te, Ca, Bi, Pb at contents which are less than or equal to 0.1%,

the balance being iron and impurities resulting from the production operation, the chemical composition further complying with the following relationships:

$$0.1\% \leq C - \text{Ti}/4 - \text{Zr}/8 + 7\text{xN}/8 \leq 0.55\%$$

and:

$$\text{Ti} + \text{Zr}/2 - 7\text{xN}/2 \geq 0.05\%$$

and:

$$1.05\text{xMn} + 0.54\text{xNi} + 0.50\text{xCr} + 0.3\text{x}(\text{Mo} + \text{W}/2)^{1/2} + K > 1.8$$

with $K = 0.5$ if $B \geq 0.0005\%$ and $K = 0$ if $B < 0.0005\%$,

according to which the plate is subjected to a thermal quenching processing operation which is carried out in the heat for forming in the hot state and, for example, rolling heat, or after austenitization by reheating in a furnace in order to carry out the quenching:

- the workpiece or the plate is cooled at a mean cooling rate greater than 0.5°C/s between a temperature greater than AC_3 and a temperature of from $T = 800 - 270\text{x}C^* - 90\text{xMn} - 37\text{xNi} - 70\text{xCr} - 83\text{x}(\text{Mo} + \text{W}/2)$, with $C^* = C - \text{Ti}/4 - \text{Zr}/8 + 7\text{xN}/8$, to $T - 50^\circ\text{C}$,
- the workpiece or the plate is then cooled at a core cooling rate $V_r < 1150\text{xep}^{-1.7}$ and greater than 0.1°C/s between the temperature T and 100°C , ep being the thickness of the plate expressed in mm,
- the workpiece or the plate is cooled as far as ambient temperature and optionally planishing is carried out.

2. (original): Method according to claim 1, characterized in that:

$$1.05\text{xMn} + 0.54\text{xNi} + 0.50\text{xCr} + 0.3\text{x}(\text{Mo} + \text{W}/2)^{1/2} + K > 2.$$

3. (currently amended): Method according to claim 1, ~~claim 1 or claim 2~~, characterized in that:

$$C > 0.45\%.$$

4. (currently amended): Method according to claim 1, ~~any one of claims 1 to 3~~, characterized in that:

$$\text{Si} + \text{Al} > 0.5\%.$$

5. (currently amended): Method according to claim 1, ~~any one of claims 1 to 4~~, characterized in that:

$$\text{Ti} + \text{Zr}/2 > 0.10\%.$$

6. (currently amended): Method according to claim 1, ~~any one of claims 1 to 5~~, characterized in that:

$$\text{Ti} + \text{Zr}/2 > 0.30\%.$$

7. (currently amended): Method according to claim 1, ~~any one of claims 1 to 6~~, characterized in that:

$$\text{C}^* \geq 0.22\%.$$

8. (currently amended): Method according to claim 1, ~~any one of claims 1 to 7~~, characterized in that tempering is further carried out at a temperature which is less than or equal to 350°C.

9. (currently amended): Method according to claim 1, ~~any one of claims 1 to 8~~, characterized in that, in order to add titanium to the steel, the liquid steel is placed in contact with a slag containing titanium and the titanium of the slag is caused to diffuse slowly in the liquid steel.

10. (original): Workpiece, and in particular a plate, of steel which is resistant to abrasion and whose chemical composition comprises, by weight:

$$0.35\% \leq \text{C} \leq 0.8\%$$

$$0\% \leq \text{Si} \leq 2\%$$

$$0\% \leq \text{Al} \leq 2\%$$

$$0.35\% \leq \text{Si} + \text{Al} \leq 2\%$$

$$0\% \leq \text{Mn} \leq 2.5\%$$

$$0\% \leq \text{Ni} \leq 5\%$$

$$0\% \leq \text{Cr} \leq 5\%$$

$$0\% \leq \text{Mo} \leq 0.50\%$$

$$0\% \leq \text{W} \leq 1.00\%$$

$$0.1\% \leq \text{Mo} + \text{W}/2 \leq 0.50\%$$

$$0\% \leq \text{B} \leq 0.02\%$$

$$0\% \leq \text{Ti} \leq 2\%$$

$$0\% \leq \text{Zr} \leq 4\%$$

$$0.05\% \leq \text{Ti} + \text{Zr}/2 \leq 2\%$$

$$0\% \leq \text{S} \leq 0.15\%$$

$$\text{N} < 0.03\%$$

- optionally from 0% to 1.5% of copper,
- optionally at least one element selected from Nb, Ta and V at contents such that $\text{Nb}/2 + \text{Ta}/4 + \text{V} \leq 0.5\%$,
- optionally at least one element selected from Se, Te, Ca, Bi, Pb at contents less than or equal to 0.1%,

the balance being iron and impurities resulting from the production operation, the chemical composition further complying with the following relationships:

$$0.1\% \leq \text{C} - \text{Ti}/4 - \text{Zr}/8 + 7\text{xN}/8 \leq 0.55\%$$

and:

$$\text{Ti} + \text{Zr}/2 - 7\text{xN}/2 \geq 0.05 \%$$

and:

$$1.05\text{xMn} + 0.54\text{xNi} + 0.50\text{xCr} + 0.3\text{x}(\text{Mo} + \text{W}/2)^{1/2} + \text{K} > 1.8$$

with: $\text{K} = 0.5$ if $\text{B} \geq 0.0005\%$ and $\text{K} = 0$ if $\text{B} < 0.0005\%$,

whose surface evenness is characterized by a deflection of less than 12mm/m, the steel having a martensitic or martensitic/bainitic structure, the structure further containing from 5% to 20% of retained austenite and carbides.

11. (original): Workpiece according to claim 10, characterized in that:

$$1.05\text{xMn} + 0.54\text{xNi} + 0.50\text{xCr} + 0.3\text{x}(\text{Mo} + \text{W}/2)^{1/2} + \text{K} > 2.$$

12. (currently amended): Workpiece according to claim 10, ~~claim 10 or claim 11~~, characterized in that:

C > 0.45%.

13. (currently amended): Workpiece according to claim 10, ~~any one of claims 10 to 12~~, characterized in that:

Si + Al > 0.5%.

14. (currently amended): Workpiece according to claim 10, ~~any one of claims 10 to 13~~, characterized in that:

Ti + Zr/2 > 0.10%.

15. (currently amended): Workpiece according to claim 10, ~~any one of claims 10 to 14~~, characterized in that:

Ti + Zr/2 > 0.30%.

16. (currently amended): Workpiece according to claim 10, ~~any one of claims 10 to 15~~, characterized in that:

$C^* \geq 0.22\%$.

17. (currently amended): Workpiece according to claim 10, ~~any one of claims 10 to 16~~, characterized in that it is a plate having a thickness of from 2 mm to 150 mm and whose surface evenness is characterized by a deflection of less than 12mm/m.

18. (currently amended): Workpiece according to claim 10, ~~any one of claims 10 to 17~~, characterized in that the hardness is from 280 HB to 450 HB and:

$0.1\% \leq C - Ti/4 - Zr/8 + 7xN/8 \leq 0.2\%$.

19. (currently amended): Workpiece according to claim 10, ~~any one of claims 10 to 17~~, characterized in that the hardness is from 380 HB to 550 HB and:

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$$0.2\% < C - Ti/4 - Zr/8 + 7xN/8 \leq 0.3\%.$$

20. (currently amended): Workpiece according to claim 10, ~~any one of claims 10 to 17~~, characterized in that the hardness is from 450 HB to 650 HB and:

$$0.3\% < C - Ti/4 - Zr/8 + 7xN/8 \leq 0.5\%.$$